

SHANNON SULLIVAN CIGAN

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EDUCATION

- **University of Minnesota, Minneapolis, MN**

Doctor of Philosophy, Occupational and Environmental Epidemiology concentration, Division of Environmental Health Sciences, School of Public Health, 2019

Dissertation title: "Urinary cadmium and lung cancer risk in smokers from the Multiethnic Cohort Study"

Master of Public Health, Division of Environmental Health Sciences, School of Public Health, 2017

Thesis title: "Biomarkers of in-utero and early childhood exposure to manganese"

- **University of North Carolina, Chapel Hill, NC**

Certificate of Public Health Concepts, School of Public Health, 2013

- **Georgia State University, Atlanta, GA**

Master of Science, Organic Chemistry, 2008

Thesis title: "Synthesis of 2,4-Disubstituted Pyrimidine Derivatives as Potential 5-HT₇ Receptor Antagonist"

Bachelor of Science, Chemistry, 2006

RESEARCH EXPERIENCE

Division of Epidemiology and Clinical Research, University of Minnesota Minneapolis, MN
September 2019

Postdoctoral associate – Jenny Poynter, PhD and Nathan Pankratz, PhD

- Conducts data analysis for genomic studies of childhood cancer
- Prepares peer-reviewed publications based on analyses

Masonic Cancer Center, University of Minnesota Minneapolis, MN **January 2015 – September 2019**

Researcher - Irina Stepanov, PhD Laboratory

- Performed statistical analysis of data for various tobacco related projects
- Processed and analyzed human biological samples and tobacco samples for quantitative analysis assays
- Prepared biomarkers for analysis of various trace level metals (Mn, Fe, Cd, As, Pb)
- Maintained a repository of biological samples
- Prepared manuscripts for publication
- Conducted literature searches, as suggested by principal investigator, and participate in the intellectual aspects of tobacco projects

Minnesota Department of Health (MDH), St. Paul, MN

October 2014 – October 2015

Infant Mortality Review Student Worker Senior Paraprofessional - Division of Community and Family Health, Maternal and Child Health Section

- Provided assistance to the Infant Mortality Consultant in the development of a state infant mortality review plan
- Analyzed state infant mortality data for the Title V block grant application updates
- Organized, and participated in the Maternal and Child Health Advisory Task Force Stillbirth Work Group

- Conducted literature reviews including research on policies in other states for white papers and update to state review plan
- Provided assistance to the Maternal Mortality Consultant in the development of a state maternal mortality review plan, and other maternal mortality related activities

Minnesota Pollution Control Agency (MPCA), St. Paul, MN

August 2014 – October 2014

Green Chemistry Student Paraprofessional

- Provided assistance to the MPCA Green Chemistry and Design coordinator and the Waste and Toxic Pollution Prevention Policy Unit
- Conducted secondary research, outreach, interviews, analyzed data including data analysis collection/management for white papers
- Projects included white paper work on BPA in thermal paper, and Toxic Free Kids Act Chemicals of High Concern analysis

Centers for Disease Control and Prevention (CDC), Atlanta GA

February 2009 – September 2014

Associate Research Fellow – Chemist, Inorganic and Radiation Analytical Toxicology Branch (IRATB)

- Trained statistician role in reviewing branch QC/SAS plot data for the multielement panel, total arsenic and blood mercury methods for reporting
- Utilized the Urine Arsenic Species HPLC-ICP-DRC-MS Method for measuring metals in tobacco smokers (The Population Assessment of Tobacco and Health, PATH), National Health and Nutrition Examination Survey (NHANES) and emergency response samples
- Optimized Urine Arsenic Species HPLC-ICP-DRC-MS Method for use in tobacco related studies, NHANES and emergency response samples
- Prepared and interpreted results from measuring metals in tobacco smokers (PATH), NHANES and emergency response samples for reporting
- Performed routine quantitative and qualitative analysis of NHANES and PATH studies
- Developed methods and performed analysis on Sodium Iodide (NaI) Gross Gamma Screening Systems: CDC Gamma Rapid Radionuclide Screen method
- Performed analysis on High Purity Germanium (HPGe) Detectors
- Maintained Clinical Laboratory Improvement Amendment (CLIA) protocols and guidelines
- Provided laboratory support for epidemiologic investigations and studies
- Contributed in Emergency Responses: FDA EPI-Aid Response and Fukushima Response
- Developed and allocated web documents for training purposes during an emergency response
- Participated in CDC Chemical Emergency Response Team; Emergency Operations Tier Three Responder
- Assisted with the Emergency Operations Center (EOC) in collection of data
- Participated in objective review panels supporting the funding of opportunities for issues in public health

Georgia State University, Atlanta GA

June 2002 – August 2008

Graduate Research – Organic Chemistry, Professor Lucjan Strekowski

- Synthesized a series of 2-chloropyrimidine derivatives tested as antagonists against the 5-HT_{2a} and 5-HT₇ receptors
- Performed multi-step synthesis of organic compounds (bromine-lithium exchange, oxidation and addition-elimination reactions)
- Utilized purification techniques using normal phase silica gel column chromatography
- Characterized compounds using ¹H-NMR and ¹³C-NMR spectroscopy, chemical combustion and melting point analysis
- Performed as a teacher's assistant in organic chemistry and general chemistry courses
- Instructed organic chemistry laboratory

Undergraduate Research – Organic Chemistry, Professor Gabor Patonay

- Studied spectroscopic methods for forensic analytical chemistry using NIR spectroscopy
- Prepared tile, paper and cloth samples with latent blood for testing

PUBLICATIONS

In press

- **Cigan, Shannon S.**, McGovern, Patricia M., Choudhary, Kriti Miller, Neely C., Georgieff, Michael, Rao, Raghavendra, Stepanov, Irina. Toenail manganese as a potential biomarker for in-utero and early childhood exposure studies. *Scientific Reports* 2018, 8: 17034. DOI:10.1038/s41598-018-35112-0
- Miller, Neely C., McGovern, Patricia M., Stepanov, Irina, **Sullivan, Shannon M.**, Mongin, Steven J., Rao, Raghavendra., Georgieff, Michael. Early exposure to manganese may alter cognition in infants. *Minnesota Medicine*. 2018;101 (05-06)
- Strekowski, L., Saczweski, J., Raux, EA., Fernando NT., Klenc, J., Paranjpe, S., Raszkievicz, A., Blake, AL., Ehalt, AJ., Barnes, S., Baranowski, TC., **Sullivan, SM.**, Satala, G., Bojarski, AJ. Synthesis and Structure-Activity Relationship Analysis of 5-HT₇ Receptor Antagonists: Piperazin-1-yl Substituted Unfused Heterobiaryls. *Molecules* 2016, 21(4), 433
- Saczweski, J., Paluchowska, A., Klenc, J. Raux, E., Barnes, S., **Sullivan, S.**, Duszynska, B., Bojarski, J., Strekowski, L. Synthesis of 4-Substituted 2-(4-Methylpiperazino)pyrimidines and Quinazoline Analogs as Serotonin 5-HT_{2A} Receptor Ligands. *J. Heterocyclic Chem.*, (2009) 46, 1259.

In preparation

- **Cigan, Shannon M.**, Ma, B., Alexander, Bruce H., Mandel, Jeffrey H., Stepanov, I. Relationship between extracellular iron and circulating inflammation markers in plasma of Minnesota taconite workers. *In draft*.
- **Cigan, Shannon S.**, Jenson, Joni., Murphy, Sharon E., Hatsukami, Dorothy, Stepanov, Irina. Differences in urinary cadmium levels in African American and White smokers. *In draft*.
- **Cigan, Shannon S.**, Bruce H. Alexander, S. Lani Park, Irina Stepanov. Ethnic differences of urinary cadmium in cigarette smokers from the Multiethnic Cohort with differing risk for lung cancer. *In draft*.
- **Cigan, Shannon S.**, Bruce H. Alexander, S. Lani Park, Irina Stepanov. Genome-wide and candidate gene association study of urinary cadmium levels in smokers. *In draft*.
- **Cigan, Shannon S.**, Bruce H. Alexander, S. Lani Park, Irina Stepanov. Association between urinary cadmium levels and risk of lung cancer in smokers from a prospective cohort study. *In draft*.
- Carroll, Dana M., **Cigan, Shannon S.**, Ikuemonisan, Joshua, Stepanov, Irina., Hatsukami, Dorothy. The impact of urinary creatinine on comparisons of urinary biomarkers of tobacco exposure by race and sex. *In draft*.
- Alcheva, Aleksandra., Kapphahn, Rebecca., Jensen, Joni., **Cigan, Shannon.**, Murphy, Sharon., Hatsukami, Dorothy., and Stepanov, Irina. Mitochondrial DNA content in oral mucosa cells from African-American and White smokers. *In draft*.

PRESENTATIONS, POSTERS AND EXHIBITS

Oral Presentations at Professional Meetings, Conferences, etc.

- **Cigan, Shannon S.**, Murphy S.E., Alexander, B.H., Park, S.L., Stepanov, I. "Cadmium exposure and lung cancer risk in smokers from the Multiethnic Cohort Study". Society for Research on Nicotine and Tobacco (SRNT) Annual Meeting, March 12, 2020.
- **Cigan, Shannon S.**, Alexander, Bruce H., Park, Lani S., Stepanov, I. "Relationship between urinary cadmium and occupation in smokers from the Multiethnic Cohort Study". International Conference on Emerging Challenges to Environmental and Occupational Health Sustainability". Jamia Millia Islamia (A Central University), New Delhi, India. January 17, 2019
- **Sullivan, S.M.**, Jones, R.L., Buzzell, J.J., Caldwell, K.L. "Validation and Use of a Rapid Radionuclide Gamma "Screening" Method, or Bioassay, for Population Biomonitoring After a Radiological Terrorist

Event" RRCM-BAER'09 Radiobioassay and Radiochemical Measurements Conference. San Antonio, TX. October 26-30, 2009.

- **Shannon M. Sullivan**, Robert L. Jones, Jennifer J. Buzzell, and Kathleen L. Caldwell "Method development for a rapid radionuclide gross gamma "screen", or bioassay, for population monitoring after a radiological terrorist event" Radioanalytical and Radiobioassay Measurement Conference 2010 in Richland, WA.

Internal Seminars – University of Minnesota

- **Sullivan, Shannon**. "Cadmium Exposure and Lung Cancer Risk in Smokers". Lightning Talk. Occupational and Environmental Health and Safety Research Seminar. February 16, 2018.
- **Sullivan, Shannon**. "Ethnic specific differences in the association of urinary cadmium and the risk of lung cancer and respiratory disease: focus on smokers from five different ethnic groups." Dissertation Proposal Idea. Occupational and Environmental Health and Safety Research Seminar. April 28, 2017.
- **Sullivan, Shannon**. "Urinary cadmium and lung cancer risk in smokers from the Multiethnic Cohort Study". Dissertation preliminary defense. November 2, 2017.
- **Sullivan, Shannon**. "Biomarkers of in-utero and early childhood exposure to manganese. MPH Defense". University of Minnesota. January 9, 2017.
- **Sullivan, S.**, Ma, B., Alexander, B.H., Mandel, J.H., Stepanov, I. "Relationship between extracellular iron and circulating inflammation markers in plasma of Minnesota taconite workers". Occupational and Environmental Health and Safety Research Seminar.
- **Sullivan, S.**, McGovern, P., Choudary, K., Miller, N., Raghavendo, R., Georgieff, M., and Stepanov, I. "Biomarkers of in-utero and early childhood exposure to manganese". Occupational and Environmental Health and Safety Research Seminar.

External Seminars

- **Cigan, Shannon S.** "Urinary Cadmium and Lung Cancer Risk in Smokers from the Multiethnic Cohort Study". National Institute of Environmental Health Sciences (NIEHS). November 5, 2018.
- **Shannon M. Sullivan**, Robert L. Jones, Jennifer J. Buzzell, and Kathleen L. Caldwell, "Method development for a rapid radionuclide gross gamma "screen", or bioassay, for population monitoring after a radiological terrorist event" Occupational and Environmental Health and Safety Research Seminar.
- **Shannon M. Sullivan**. "Centers for Disease Control and Prevention and Florida Department of Health Community Reception Center Drill." Inorganic Radiation and Toxicology Branch seminar.

Invited Presentations – University of Minnesota

- **Sullivan, Shannon**. "Cadmium Exposure and Lung Cancer Risk in Smokers". School of Public Health Research Day Lightning Round Presenter. April 18, 2018.
- **Sullivan, Shannon**. "Experience and Research Contributions at the School of Public Health". Emeritus Faculty Luncheon. October 12, 2017.
- **Sullivan, Shannon**. "Personal Experience Doing Research at the School of Public Health. Why MN?" Admitted Student Event. March 9, 2017.
- **Sullivan, Shannon**. "My Pathway to the School of Public Health". Undergraduate Public Health Association. March 18, 2006.

Poster Presentations at Professional Meetings, Conferences, etc.

- **Cigan, Shannon S.**, Kelly, S.T., Meredith, J.J., Cole, B.R., Pankratz, N. and Poynter, J. "Predicted leukocyte telomere length and risk of pediatric germ cell tumors". Pediatric Research, Education and Scholarship Symposium (PRESS), April 24, 2020.
- **Cigan, Shannon S.**, Alexander, B., Park, S.L., Stepanov, I. "Variation in levels of urinary cadmium and its relationship with occupation in smokers from the Multiethnic Cohort Study". International Society for Environmental Epidemiology 31st Annual Conference, August 26, 2019.

- **Cigan, Shannon S.**, Jenson, J., Murphy, S. E., Hatsukami, D., Stepanov, I. “Differences in urinary cadmium levels in African American and White smokers”. Society for Research on Nicotine and Tobacco 25th Annual Meeting, February 22, 2019.
- **Sullivan, S.**, Park, S.L., Stepanov, I. “Cadmium Exposure and Lung Cancer Risk in Smokers”. Masonic Cancer Center 8th Annual Cancer Research Symposium, University of Minnesota March 29, 2018
- **Sullivan, Shannon M.**, Ma, B., Alexander, Bruce H., Mandel, Jeffrey H., Stepanov, I. (2017) “Relationship between extracellular iron and circulating inflammation markers in plasma of Minnesota taconite workers”. 26th EPICOH, Edinburgh, Scotland, August 2017.
- **Sullivan, S.**, Ma, B., Alexander, BH., Mandel, JH., Stepanov, I. “Relationship between extracellular iron and circulating inflammation markers in plasma of Minnesota taconite workers”. Nora Symposium, University of Minnesota May 5, 2017
- **Sullivan, S.**, McGovern, P., Choudary, K., Miller, N., Raghavendo, R., Georgieff, M., and Stepanov, I. “Biomarkers to Assess Neurodevelopmental Toxicity of Manganese: A Pilot Study”. APHA 2016 Annual Meeting and Expo in Denver, CO.
- **Sullivan, S.**, McGovern, P., Choudary, K., Miller, N., Raghavendo, R., Georgieff, M., and Stepanov, I. “Biomarkers to Assess Neurodevelopmental Toxicity of Manganese: A Pilot Study”. School of Public Health Research Day. Minneapolis, MN.
- **Shannon M. Sullivan**, Robert L. Jones, Jennifer J. Buzzell, and Kathleen L. Caldwell. “Method development for a rapid radionuclide gross gamma "screen", or bioassay, for population monitoring after a radiological terrorist event”. Third Annual DLS Poster Symposium June 13, 2011 – CDC/DLS.
- **Shannon M. Sullivan**, Cynthia D. Ward, Nolan D. Hilliard, Jenny Ysseldyke, Joshua Godshaw, Kathleen L. Caldwell and Robert L. Jones. “Platform Comparison for Separation and Quantification of Seven Arsenic Species in Human Urine by HPLC-ICP-DRC-MS” 2014 Winter Conference on Plasma Spectrochemistry January 8, 2014 in Amelia Island, FL.
- Nolan D. Hilliard^a, Amir A. Makhmudov^b, Kathleen L. Caldwell^b, Carl P. Verdon^b, Julia A. Heizman^a, **Shannon M. Sullivan**^c. “Quantification of Iodine Content in U.S. and International Salt Samples by Inductively Coupled Plasma Mass Spectrometry”, a poster presented at the Winter Plasma Conference, Ft. Myers, FL. January 4-9, 2010.
- Julia A. Heizman^a, Nolan D. Hilliard^a, Amir A. Makhmudov^b, Kathleen L. Caldwell^b, Carl P. Verdon^b, **Shannon M. Sullivan**^c “Measuring Iodine in Salt: Checking Accuracy and Precision of Methods Used to Quantify Salt Iodide Content in Salt,” a poster presented at the Centers for Disease Control and Prevention. Atlanta, GA. July 27, 2009.
- S Barnes, J Klenc, **S Sullivan**, J Saczewski, A Raszkievicz, and L Strekowski. “Substituted Pyrimidines as Potential Serotonin Inhibitors and Drug Candidates,” a poster presented at Georgia Life Science Summit 2007.

Service Presentations

- The 8th Annual Minneapolis Public School STEM & Career Exploration Expo. Minneapolis Convention Center. March 20, 2019.
- Blake High School Lab tour. University of Minnesota. December 18, 2018.
- The School of Biology – exploring careers in health sciences – lab tour. University of Minnesota. December 4, 2018.
- SCRUBS Camp Minneapolis Public Schools - exploring careers in the health sciences – tour. Masonic Cancer Center. Presentation “Are E-Cigarettes Safer Than a Cigarette?” July 26, 2018.
- Cancer and the Human Body exhibit presented by Masonic Cancer Center and Science Museum of Minnesota. March 5, 2018.
- Cancer and the Human Body exhibit presented by Masonic Cancer Center and Science Museum of Minnesota. March 4, 2017

AWARDS AND HONORS

University Awards

- Masonic Cancer Center Annual Symposium, April 22, 2020

Top 10 Outstanding Abstract

- School of Public Health Research Day, April 11, 2019
People's Choice Student Poster Award
- School of Public Health Student Senate
Professional Development Grant Awardee (\$200), April 2019
- Council of Graduate Students (COGS)
Conference Travel Grant Awardee (\$670), April 2019
- School of Public Health Student Senate
Professional Development Grant Awardee (\$200), March 2018
- Council of Graduate Students (COGS)
Conference Travel Grant Awardee (\$520), August 2017
- Herbert M. Bosch Award: Division of Environmental Health Sciences, University of Minnesota, May 2017.
- Public Health Impact Award: University of Minnesota Research Day, April 7, 2016.
- National Institute for Occupational Safety and Health (NIOSH) Trainee Award in Occupational and Environmental Epidemiology program, 2015-current.

Professional Affiliation Awards

- Delta Omega Honorary Society in Public Health
Pi Chapter at the University of Minnesota School of Public Health.
- Society for Research on Nicotine and Tobacco Research 25th Annual Meeting
Travel Grant Awardee (\$710) based on submitted abstract, February 2019

Centers for Disease Control and Prevention Team Awards

- Excellence in Emergency Response: *International Mexico Mercury Laboratory Response Group*. 2013 NCEH/ATSDR Honor Awards Ceremony, January 28, 2014.
- FDA Group Recognition Honor Award: *Medical Isotope Contamination Investigation Group* at the 53rd Annual FDA Honor Awards Ceremony, July 24, 2013. U.S. Department of Health and Human Services. Public Health Service Food and Drug Administration.
- Certificate of Appreciation in Excellence in Epidemiology – *Domestic for the Radioactive Strontium Exposure Investigation: For conducting a rapid radiologic investigation to assess the public health impact of CardioGen-82 PET imaging*. September 5, 2012. Centers for Disease Control and Prevention. Agency for Toxic Substances and Disease Registry. Thomas R. Frieden, M.D., MPH. Director, CDC.
- Award in Excellence in Epidemiology – *Domestic for the Radioactive Strontium Exposure Investigation Group*. December 12, 2012. U.S. Department of Health and Human Services. Centers for Disease Control and Prevention. National Center for Environmental Health/Agency for Toxic Substances and Disease Registry. Christopher J. Portier, PhD Director, NCEH/ATSDR.
- Award in Excellence in Emergency Response – *International for the NCEH/ATSDR Fukushima Response Team*. December 14, 2011. U.S. Department of Health and Human Services. Centers for Disease Control and Prevention. National Center for Environmental Health/Agency for Toxic Substances and Disease Registry. Christopher J. Portier, PhD Director, NCEH/ATSDR.
- *Certificate of Recognition in Outstanding Contribution to Rapidly and Efficiently Completing the FDA EPI-Aid Gamma Analysis*. CDC Division of Laboratory Sciences. Fall 2011. Inorganic and Radiation Analytical Toxicology Branch. Robert L. Jones, PhD Chief, IRATB.

TEACHING EXPERIENCE

University of Minnesota, Minneapolis MN

Guest lecturer

- Biomarkers (PUBH 6162)
- Pathophysiology of Human Disease (PUBH 6355)
- Occupational and Environmental Health and Safety Research Seminar (PUBH 8120)

- Undergraduate Public Health Association (UPHA)

Augsburg University, Minneapolis MN

Adjunct Faculty Instructor

- General Chemistry Laboratory (CHM 115)
- Organic Chemistry Laboratory (CHM 251)

Hamline University, St. Paul MN

Invited lecturer

- Introduction to Public Health (HSCI 1100)

Georgia State University, Atlanta GA

Graduate Research Assistant Instructor

- General Chemistry Laboratory (CHEM 1211 L/1212 L)
- Organic Chemistry Laboratory (CHEM 3100/3110)
- Organic Chemistry Problems (CHEM 2401)

SERVICE AND PUBLIC OUTREACH

Service to the Discipline/Profession/Interdisciplinary Area(s)

Reviewer experience

- Scientific Reports Journal, manuscript reviewer
- Public Health Reviewer, University of Minnesota School of Public Health manuscript reviewer
- Society for Research on Nicotine and Tobacco 2020 Annual Meeting abstract reviewer
- Eliminating Health Disparities Initiative (EHDI) grant review note taker, Minnesota Department of Health
- Public Health Review Journal, University of Minnesota
- University of Minnesota Council of Graduate Students Career Development, Conference Travel and Needs-Based Grant
- Centers for Disease Control and Prevention (CDC) Grant Reviewer

Committee Membership

- Society for Nicotine on Research and Tobacco (SRNT) Global Research Network Education Subcommittee
- Society for Nicotine on Research and Tobacco (SRNT) Knowledge Center Subcommittee
- University of Minnesota Council of Graduate Students Grants Committee

Service to the University

- School of Public Health Ambassador, University of Minnesota, Minneapolis MN
- 3rd International Conference on One Medicine One Science (iCOMOS) 2018 note taker, Minneapolis MN

Service to the Community

- Girls on the Run (GOTR), Minneapolis MN, assistant coach
- Master Gardener for Hennepin County, Minneapolis MN, community
 - Participates in the Junior Master Gardener Program aimed at children in the community
 - "Ask a Master Gardener" booth at the Minnesota State Fair booth. August 2016
- Tobacco Youth Program – Development of Content for Peer Educators– Community Outreach with Masonic Cancer Center. Ongoing.
- Cancer and the Human Body exhibit presented by Masonic Cancer Center at the Science Museum of Minnesota. 2017 and 2018.

PROFESSIONAL AFFILIATIONS

- International Society for Environmental Epidemiology (ISEE), member 2018 - present

- Society for Research on Nicotine and Tobacco (SRNT), member 2018 - present
 - SRNT Global Research Network
 - SRNT Global Research Network Education Subcommittee (GRNES)
 - SRNT-U Knowledge Center Management Team, volunteer
- Minnesota Environmental Health Association (MEHA), member 2014 – present
- Minnesota Hobby Beekeepers Association (MHBA) 2016 – present
- American Public Health Association (APHA), member 2015 – 2018
 - APHA Student Assembly Campus Liaison, volunteer 2017 – 2018
- Society for Epidemiologic Research (SER), member 2015 – 2018
- American Society for Testing and Materials International (ASTM), member 2009 – 2014
 - ASTM D19.04 Subcommittee on Methods of Radiochemical Analyses for Radioactivity in Water
- Department of Health and Human Services, member 2009 – 2014
 - Centers for Disease Control Chemical Emergency Response Team (CERT)
 - Division of Laboratory Sciences Safety Committee Member

COMPUTER SOFTWARE

- Statistical Analysis Software:
 - STATA
 - R: The R Project for Statistical Computing
 - PLINK: Whole genome data analysis toolset
 - SAS/QC Software
 - Prism
- ICP/MS Instrument Software:
 - Chromera® Chromatography Data systems
 - ChromLink™ (PerkinElmer LAS),
 - ELAN® Windows Software
 - NexION™ Windows Software
 - PerkinElmer's TotalChrom™ Workstation package
 - Microsoft Excel® macro
- Gamma and Alpha Radiation Spectroscopy Software:
 - GammaVision-32 for Windows software
 - ORTEC® Maestro for Windows software
- Canvas X editing software
- MS SQL Server 7™ database software
- Chromera® Chromatography Data systems

INSTRUMENTATION AND TECHNIQUES

- Inductively Coupled Plasma Mass Spectroscopy (ICP-MS)
 - ELAN® ICP-DRC-MS
 - NexION™ ICP-UCT-MS
- High performance liquid chromatography (HPLC)
- Eppendorf and Beckman Coulter J-6-HC centrifuges
- Automatic Pippeter (Digiflex® and Hamilton Microlab®)
- Fluorescence spectroscopy
- Gas chromatography (GC)
- High Purity Germanium (HPGe) Detector
- 1H-NMR and 13C-NMR spectroscopy
- Infrared (IR) spectroscopy
- Mass Spectrometry (MS)

- Normal phase silica gel column chromatography
- Thin-layer chromatography (TLC)
- Ultraviolet-visible spectroscopy (UV-VIS)

PHD COMPLETED COURSEWORK

- Ethics: Practice and Policy (PuBH 6741; 1 cr)
- Biostatistics II (PuBH 6451; 4 cr)
- Statistical Methods for Correlated Data (PuBH 7430; 3 cr)
- Statistics for Human Genetics (PuBH 7445; 3 cr)
- Epidemiologic Methods II (PuBH 6342; 3 cr)
- Epidemiology III (PuBH 6343; 4 cr)
- Advanced Epidemiology Methods: Concepts (PuBH 8341; 3 cr)
- Advanced Epidemiology Methods: Applications (PuBH 8342; 3 cr)
- Advanced Epidemiology Methods: Synthesis and Application of Methods in Epidemiologic Research (PuBH 8343; 3 cr)
- Cancer Epidemiology (PuBH 6387; 2 cr)
- Genetics in Public Health (PuBH 6381; 2 cr)
- Biomarkers (PuBH 6162; 2 cr)
- Current Literature in Toxicology (PuBH 8161; 1 cr)
- Occupational Health and Safety Research Seminar (PuBH 8120; 7 cr)
- Occupational Medicine: Principles and Practice (PuBH 6130; 2 cr)
- Writing Research Grants (PuBH 6348; 2 cr)
- Making Sense of Health Studies (PuBH 6106; 2 cr)
- Writing Winning NIH Grant Proposals, day-long seminar